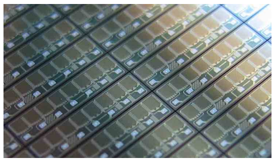
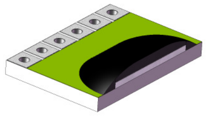
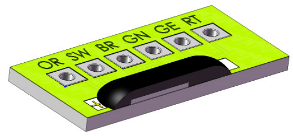
Magnetic Length Sensor MLS



DIE



Small Hybride

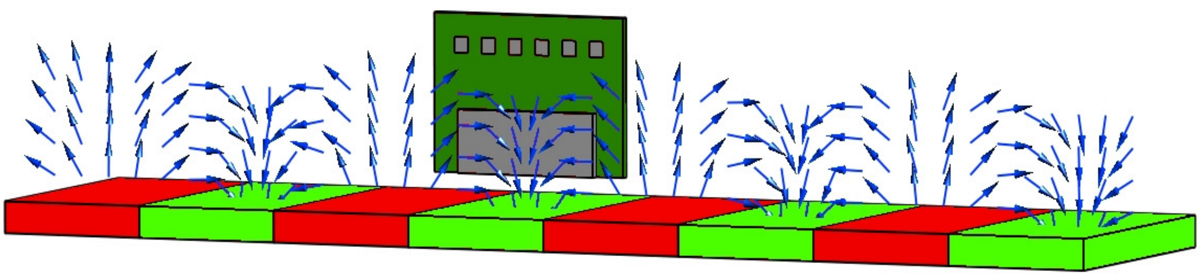


Large Hybride

- **AMR Sensor**
- **Measuring Positions, Movements, Velocities**
- **High Precision**
- **Various Pole Pitches Available**

DESCRIPTION

Sliding the MLS-Sensors along a magnetic scale will produce a sine and a cosine output signal as a function of the position. In order to deliver satisfying results, this will be achieved as long as the air gap between sensor edge and magnetic scale surface does not exceed half of the pole pitch. As the sensor principle is based on the anisotropic magneto resistance effect, the signal amplitudes are nearly independent on the magnetic field strength and therefore air gap variations do not have a big effect on the accuracy. The sensor detects a magnetic gradient field and is thus almost insensitive to homogenous stray fields.



Precise displacement values will be archived by using a sine/cosine decoder. The maximal obtainable precision depends on the distance sensor – magnetic scale and on the accuracy of the magnetic scale. Values of <1% of the pole pitch are common.

FEATURES

- Sin- / Cos-Output Signals Suitable for Signal Evaluation by Standard-ASIC's
- High Precision
- Insensitive to Air Gap Fluctuations
- Highly Reliable
- Low Interference Field Sensitivity

APPLICATIONS

- Measuring Positions, Movements, Velocities
- Angular Measurement using Pole Wheels

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CHARACTERISTIC VALUES

Parameter	Symbol	Condition	Type	Min	Typ	Max	Unit
A. Operating Limits							
max. supply voltage	$V_{cc,max}$					10	V
max. current (both bridges)	$I_{cc,max}$		MLS1000 MLS2000/5000			5 10	mA
operating temperature	T_{op}			-40		+85	°C
storage temperature	T_{st}			-40		+125	°C
B. Sensor Specifications (T=25 °C)							
Supply voltage	V_{cc}				5		V
pole pitch *)	p		MLS1000 MLS2000 MLS5000		1000 2000 5000		µm
Resistance (both bridges)	R_b		MLS1000 MLS2000/5000	2000 1000	3000 1500	4000 2000	Ω
Output signal range	$\Delta V_n/V_{cc}$	Condition A, B		16	20		mV/V
Offset voltage	$V_{n\ off}$	Condition A, B		-1	0	+1	mV/V
C. Sensor Specifications							
TC of amplitude	TCSV	Condition A, C		-0.36	-0.32	-0.28	%/K
TC of resistance	TCBR	Condition A, C		+0.27	+0.32	+0.37	%/K
TC of offset	TCVoff	Condition A, C		-4	0	+4	µV/V/K

n = 1;2 (bridge number); *) other pole pitches on request

MEASUREMENT CONDITIONS

Parameter	Symbol	Unit	Condition
A. Set Up Conditions			
ambient temperature	T	°C	T = 23±5 °C (unless otherwise noted)
supply voltage	V_{cc}	V	Vcc = 5 V
applied magnetic field	H	kA/m	H > 10 kA/m
B. Sensor Specifications (T=25 °C, 360° turn , H=25 kA/m , Vo_{max}>0, Vo_{min}<0)			
output signal range	$\Delta V_n / V_{cc}$	mV/V	$\Delta V_n / V_{cc} = (V_{n\ max} - V_{n\ min}) / V_{cc}$
signal offset	$V_{off\ n}$	mV/V	$V_{off\ n} = (V_{n\ max} + V_{n\ min}) / V_{cc}$

n = 1;2 (bridge number)

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MEASUREMENT CONDITIONS

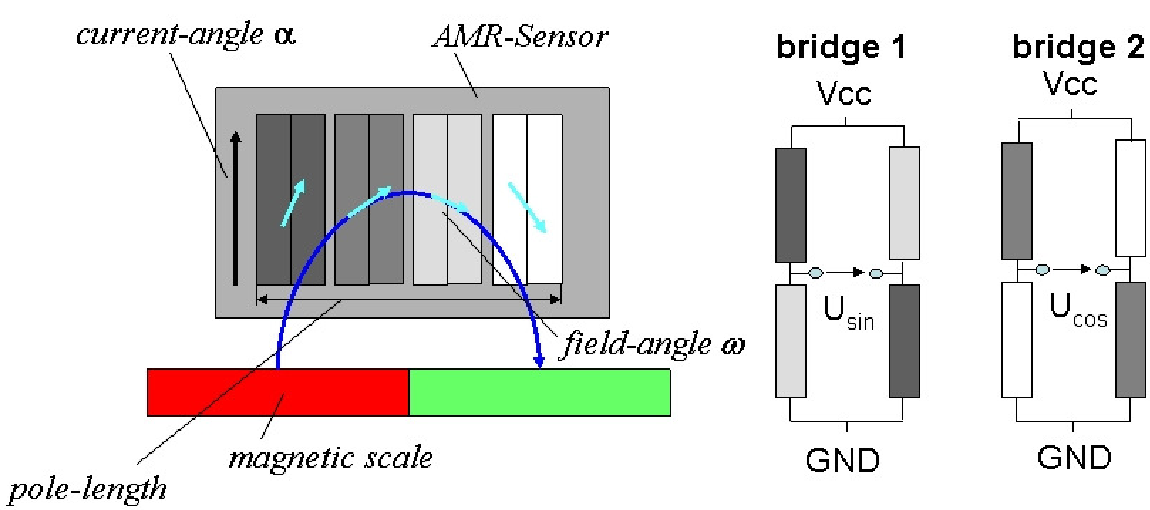
Parameter	Symbol	Unit	Condition
C. Sensor Specifications (T=-25°C, +125°C)			
ambient temperatures	T	°C	T_1 = -25 °C, T_0 = +25 °C, T_2 = +125 °C
TC of amplitude	*TCSV*	%/K	$TCV = \frac{1}{(T_2 - T_1)} \cdot \frac{\frac{\Delta V_n}{V_{cc}}(T_2) - \frac{\Delta V_n}{V_{cc}}(T_1)}{\frac{\Delta V_n}{V_{cc}}(T_1)} \cdot 100\%$
TC of resistance	*TCBR*	%/K	$TCR = \frac{1}{(T_2 - T_1)} \cdot \frac{R_n(T_2) - R_n(T_1)}{R_n(T_1)} \cdot 100\%$
TC of offset	*TCVoff*	µV/(VK)	$TCVoff_n = \frac{Voff_n(T_2) - Voff_n(T_1)}{(T_2 - T_1)}$

n = 1;2 (bridge number)

SENSOR BASICS

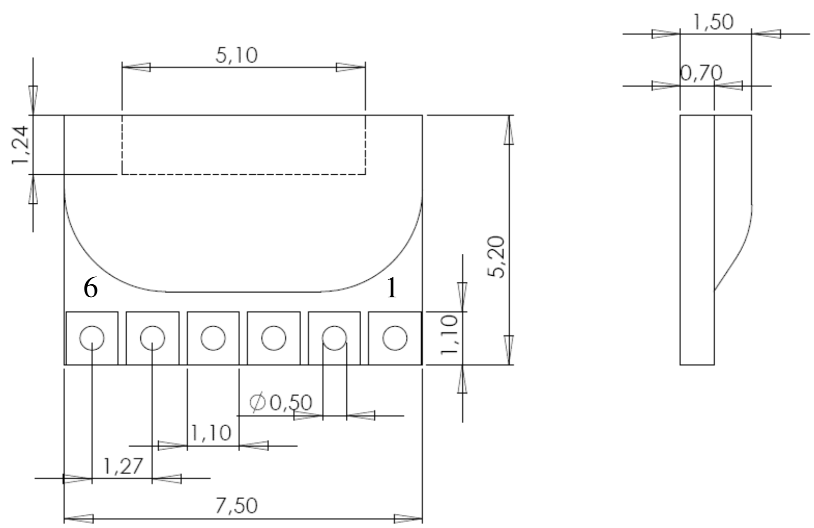
The MLS-sensors consists of two magnetoresistive Wheatstone bridges, generating two phase-shifted signals by means of a lateral offset. MLS-sensors will only cooperate well together with pole stripes meeting their design-pole pitch.

In addition, some sensor types integrate over more than one pole in order to improve sensor performance.



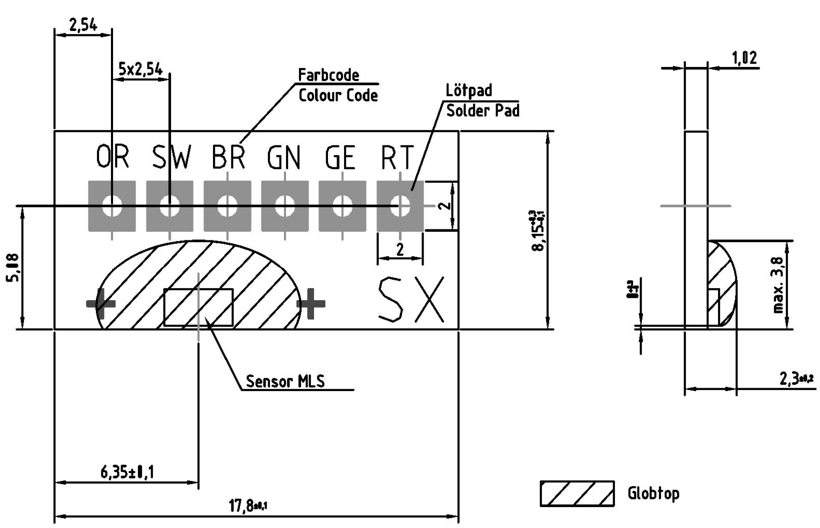
PACKAGES

HK (SMALL HYBRIDE)



Pin	Annotation	Name
1	Output signal	V_{cos-}
2	Supply voltage	V_{cc}
3	Ground	GND
4	Output signal	V_{sin-}
5	Output signal	V_{sin+}
6	Output signal	V_{cos+}

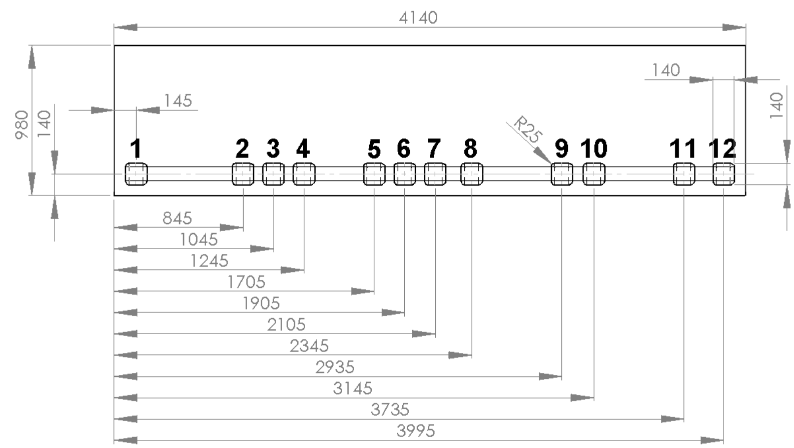
HS (STANDARD HYBRIDE)



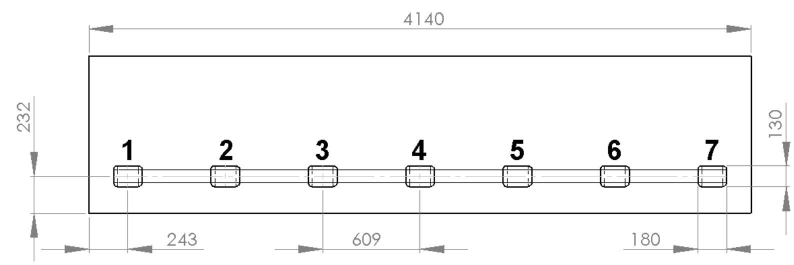
Pin	Annotation	Name
OR	Output signal	V_{cos-}
SW	Supply voltage	V_{cc}
BR	Ground	GND
GN	Output signal	V_{sin-}
GE	Output signal	V_{sin+}
RT	Output signal	V_{cos+}

DIE GEOMETRIES

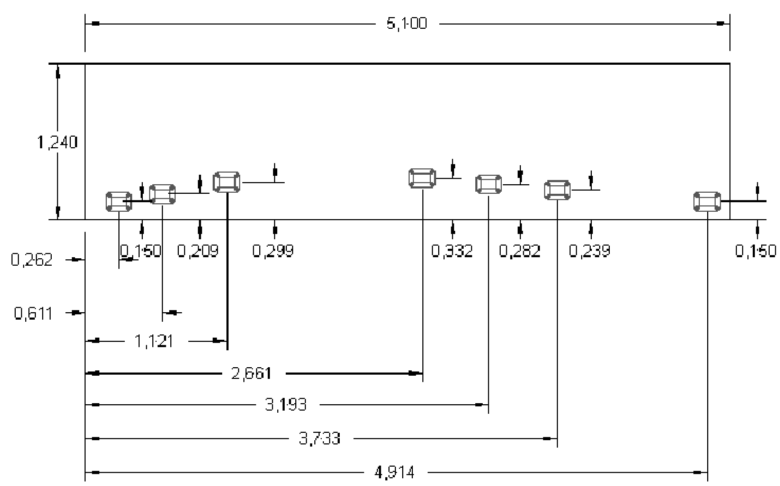
MLS 1000 (DIE)



MLS 2000 (DIE)



MLS 5000 (DIE)



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PIN ASSIGNMENT (DIES)

Pin	MLS1000	MLS2000	MLS5000
1	Vcc	-V2	Vcc (bridge 2)
2	-V1	-V1	-V2
3	+V1	-V2	-V1
4	-V1	GND	GND
5	-V2	Vcc	Vcc (bridge 1)
6	+V2	+V1	+V1
7	-V2	+V2	+V2
8	R1	-	-
9	R1	-	-
10	R2	-	-
11	R2	-	-
12	GND	-	-

ORDERING CODES

	MLS1000	MLS2000	MLS5000
Wafer (diced) *)	G-MRCH-018	on request	G-MRCH-017
Wafer (undiced) *)	G-MRCH-019	on request	G-MRCH-007
Large hybride (HS)	on request	eng. samples	G-MRCO-012
Small hybride (HK)	on request	eng. samples	G-MRCO-013

*) MOQ is one wafer

ORDERING INFORMATION